AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (currently amended) A method to package a Volume holographic filter, comprising the steps of:
recording a grating with a chirp on said filter;
modifying said grating recorded on said filter;
applying a mechanical constraint to said filter; and
altering a thermal expansion of said filter.

2. The method of claim 1 wherein said filter is a simple reflection grating filter.

3. The method of claim 1 wherein said filter is a slanted reflection grating filter.

4. The method of claim 1 wherein said filter is a transmission grating filter.

5. The method of claim 1 wherein said filter is a fixed volume holographic grating filter (VHG).

6. The method of claim 1 wherein said filter is holographically recorded using a phase mask.

7. The method of claim 1 wherein said filter is holographically recorded using a two-beam method.

8. The method of claim 1 wherein said filter is thermally compensated by means of a tube geometry.

9. The method of claim 1 wherein said mechanical constraint further comprising: inducing a strain to tailor a thermal wavelength coefficient of said filter.

10. The method of claim 1 wherein said mechanical constraint further comprising: clamping said filter by a clamp to a pre-set value such that said clamp controls said thermal expansion in a direction of said filter and wherein said filter is insensitive to a change in temperature.

11. The method of claim 1 wherein said mechanical constraint further comprising: clamping said filter by a clamp to a pre-set value such that said clamp controls said thermal expansion in a direction of said filter and wherein said filter is modified by a change in temperature.

12. The method of claim 8 wherein said tube geometry further comprises a plurality of anisotropic tubes to minimize frictional forces along any boundary of said tubes.

13. The method of claim 12 wherein said plurality of anisotropic tubes are generated by wrapping a wire around said filter.

14. The method of claim 13 wherein said wire is not made from a homogenous material.

15. The method of claim 13 wherein said wire has a thickness that is not a fixed thickness.

16. The method of claim 13 wherein said wrapping of wire around said filter forms a layer whose thickness is not a fixed thickness.

17. The method of claim 13 wherein said wrapping of wire has a pitch that is not a fixed pitch.

18. The method of claim 13 wherein said wrapping of wire can be performed at any temperature.

19. The method of claim 12 wherein said plurality of anisotropic tubes are generated by stacking a plurality of washers, each of which have a same inner diameter opening..

20. The method of claim 19 wherein said plurality of washers are held together by a soft solder that physically yields at a low level so that each of said plurality of washers stabilizes and hence prevents a buckling failure.

21. The method of claim 20 wherein said soft solder has a stiffness level less than a stiffness level of each of said plurality of washers.

22. The method of claim 19 wherein a gap between each of said plurality of washers absorbs said thermal expansion such that center of each of said plurality of washers is independent of said thermal expansion.

23. The method of claim 22 wherein each of said plurality of washers has a thickness that is not a fixed thickness and said gap between them is not a fixed gap.

24. The method of claim 9 wherein said thermal wavelength coefficient is modified by a clamp arrangement comprising of a plurality of plates, a plurality of spacers, and a plurality of attaching means such that said filter is placed between a pair of spacers to form a stack which is in turn placed between a pair of plates that are pressed together by said plurality of attaching means at a temperature.

25. The method of claim 24 wherein said plurality of attaching means and said plurality of spacers are each made from a material with a negative expansion coefficient.

26. The method of claim 24 wherein said plurality of plates and said plurality of attaching means both have a first thermal coefficient of expansion and said plurality of spacers have a second thermal coefficient of expansion different from said first thermal coefficient of expansion.

27. The method of claim 26 wherein said first thermal coefficient of expansion is about 16 ppm/°C.

28. The method of claim 26 wherein said second thermal coefficient of expansion is about 0.5 ppm/°C.

29. The method of claim 5 wherein said filter is inserted into a substrate with a lower thermal expansion coefficient.

30. The method of claim 29 wherein said filter has a thermal wavelength coefficient dependant on said thermal expansion coefficient of substrate and said thermal expansion

coefficient of filter, a stiffness of said filter and a stiffness of said substrate, and a geometry of said filter and a geometry of said substrate.

31. The method of claim 5 wherein said filter is bonded between a first and a second piece of substrate material wherein said first piece of substrate has a thermal expansion coefficient different from a thermal expansion coefficient of said second piece of substrate.

32. The method of claim 1 wherein recording said grating with a chirp is by a fixed amount determined by said filter.

33. The method of claim 1 wherein said package modifies said chirp with a change in temperature.

34. The method of claim 33 wherein said chirp is increased with an increase in said temperature.

35. The method of claim 33 wherein said chirp is increased with a decrease in said temperature.

36. The method of claim 33 wherein said chirp is decreased with an increase in said temperature.

37. The method of claim 33 wherein said chirp is decreased with a decrease in said temperature.

38. (currently amended) A method to package a <u>Volume</u> holographic filter, comprising the steps of:

recording a grating without a chirp on said filter;

applying a mechanical constraint to said filter; and

altering a thermal expansion of said filter.

39. The method of claim 38 wherein said filter is a simple reflection grating filter.

40. The method of claim 38 wherein said filter is a slanted reflection grating filter.

41. The method of claim 38 wherein said filter is a transmission grating filter.

42. The method of claim 38 wherein said filter is a fixed volume holographic grating filter (VHG).

43. The method of claim 38 wherein said filter is holographically recorded using a phase mask.

44. The method of claim 38 wherein said filter is holographically recorded using a two-beam method.

45. The method of claim 38 wherein said filter is thermally compensated by means of a tube geometry.

46. The method of claim 38 wherein said mechanical constraint further comprising:

inducing a strain to tailor a thermal wavelength coefficient of said filter.

47. The method of claim 38 wherein said mechanical constraint further comprising: clamping said filter by a clamp to a pre-set value such that said clamp controls said thermal expansion in a direction of said filter and wherein said filter is insensitive to a change in temperature.

48. The method of claim 38 wherein said mechanical constraint further comprising: clamping said filter by a clamp to a pre-set value such that said clamp controls said thermal expansion in a direction of said filter and wherein said filter is modified by a change in temperature.

49. The method of claim 45 wherein said tube geometry further comprises a plurality of anisotropic tubes to minimize frictional forces along any boundary of said tubes.

50. The method of claim 49 wherein said plurality of anisotropic tubes are generated by wrapping a wire around said filter.

51. The method of claim 50 wherein said wire is not made from a homogenous material.

52. The method of claim 50 wherein said wire has a thickness that is not a fixed thickness.

53. The method of claim 50 wherein said wrapping of wire around said filter forms a layer whose thickness is not a fixed thickness.

54. The method of claim 50 wherein said wrapping of wire has a pitch that is not a fixed pitch.

55. The method of claim 50 wherein said wrapping of wire can be performed at any temperature.

56. The method of claim 49 wherein said plurality of anisotropic tubes are generated by stacking a plurality of washers, each of which have a same inner diameter opening.

57. The method of claim 56 wherein said plurality of washers are held together by a soft solder that physically yields at a low level so that each of said plurality of washers stabilizes and hence prevents a buckling failure.

58. The method of claim 57 wherein said soft solder has a stiffness level less than a stiffness level of each of said plurality of washers.

59. The method of claim 56 wherein a gap between each of said plurality of washers absorbs said thermal expansion such that center of each of said plurality of washers is independent of said thermal expansion.

60. The method of claim 59 wherein each of said plurality of washers have a thickness that is not a fixed thickness and said gap between them is not a fixed gap.

61. The method of claim 46 wherein said thermal wavelength coefficient is modified by a clamp arrangement comprising of a plurality of plates, a plurality of spacers, and a plurality of attaching means such that said filter is placed between a pair of spacers to form a stack which is in turn placed between a pair of plates that are pressed together by said plurality of attaching means at a temperature.

62. The method of claim 61 wherein said plurality of attaching means and said plurality of spacers are each made from a material with a negative expansion coefficient.

63. The method of claim 61 wherein said plurality of plates and said plurality of attaching means both have a first thermal coefficient of expansion and said plurality of spacers have a second thermal coefficient of expansion different from said first thermal coefficient of expansion.

64. The method of claim 63 wherein said first thermal coefficient of expansion is about 16 ppm/°C.

65. The method of claim 63 wherein said second thermal coefficient of expansion is about 0.5 ppm/°C.

66. The method of claim 42 wherein said filter is inserted into a substrate with a lower thermal expansion coefficient.

67. The method of claim 66 wherein said filter has a thermal wavelength coefficient dependant on said thermal expansion coefficient of substrate and said thermal expansion coefficient of filter, a stiffness of said filter and a stiffness of said substrate, and a geometry of said filter and a geometry of said substrate.

68. The method of claim 42 wherein said filter is bonded between a first and a second piece of substrate material wherein said first piece of substrate has a thermal expansion coefficient different from a thermal expansion coefficient of said second piece of substrate.

69. The method of claim 38 wherein said package causes said grating to become chirped with a change in temperature.

70. The method of claim 69 wherein said chirp is increased with an increase in said temperature.

71. The method of claim 69 wherein said chirp is increased with a decrease in said temperature.

72. The method of claim 69 wherein said chirp is decreased with an increase in said temperature.

73. The method of claim 69 wherein said chirp is decreased with an decrease in said temperature.

REMARKS/ARGUMENTS

Claims 1-73 remain in this application. Reconsideration and reexamination of pending claims 1-73 is respectfully requested.

In response to the Office Action mailed January 12, 2007, the Examiner's claim rejections have been considered. Applicants respectfully traverse all rejections regarding all pending claims and earnestly solicit allowance of these claims.

1. Claim Rejections under 35 U.S.C. § 102(b)

Claims 38,42,45,46,48,49,61,62 and 66-73 are rejected by the Examiner under 35 U.S.C. § 102(b) as being fully anticipated by Lemaire et. Al (US 6,147,341).

Applicant respectfully disagrees.

Regarding claim 38, Lemaire, in Fig. 1, discloses an optical grating in a fiber which is temperature compensated by the provision of mechanical element 10, which is cylindrical and has the same length as the grating.

The current application discloses a bulk holographic grating as opposed to a fiber grating disclosed by Lemaire et al. A volume holographic grating does not have a waveguiding core like a fiber does. The volume grating is present throughout the volume of the material. Because it is not waveguided, the cross-section of the holographic grating is of the order of several millimeter square with length of several centimeters. The fiber grating disclosed has a cross section of several tens of micrometers and length of several centimeters. Therefore the ratio between the cross-section and length of the volume holographic grating is several orders of magnitude higher than for a fiber grating. Because of this fact, the element 10 in Lemaire is applied on the surface of the fiber only.

The grating element used in the rejection is different from the element used in the present invention and therefore the teachings of the present invention cannot be rejected under 35 U.S.C. 102(b).

The functional recitation of claim 38 has been amended.

Claims 42,45,46,48,49,61,62 and 66-73 are dependent claims based on independent claim 38. Inasmuch as claims 38 is allowable, these dependent claims are allowable by definition.

2. <u>Claim Rejections under 35 U.S.C. § 102(e)</u>

Claims 1-5, 8-12, 19,22-33,38-42,45-49,56 and 59-69 are rejected by the Examiner under 35 U.S.C. § 102(e) as being fully anticipated by Sullivan (US 6,621'957).

Claims 38,39,42,45-50, 54 and 55 are rejected under 35 U.S.C 102(e) as being fully anticipated by Myers et al., (US-2003/0210863).

Applicant respectfully disagrees.

Sullivan et al. disclose a mechanical apparatus positioned around a fiber for the purpose of yielding an athermal Bragg grating.
Following the same arguments than in paragraph 1. above, fiber gratings are waveguided whereas volume holographic gratings are not. The ratio between the cross-section and length of the volume holographic grating is several orders of magnitude higher than for a fiber grating. The mechanical methodology presented by Sullivan is not applicable to volume gratings.

Sullivan et al. describe the use of the reflection fiber Bragg grating as (5/42-43) " Further, the reflective element (grating) may be used in reflection and/or transmission of light". It is well known by skilled persons in the Art, that fibers are one dimensional waveguides that transmit light forward or backward along the fiber. Fiber gratings (reflective element) are written in the guiding core of the fiber. The purpose of the fiber grating is to reflect a spectral range and transmit light outside this spectral range. The term transmission used by Sullivan follows the explanation above.
The term transmission grating in the current application means that the light is incident on one side of the volume holographic grating and diffracted towards the opposite side. Transmission gratings, according to the definition above, cannot be performed with fiber Bragg gratings.

Myers et al. teach a mechanical constriction system wrapped around an optical fiber containing a fiber Bragg grating. The current application uses a volume holographic grating, which is a functionally different element than a fiber Bragg grating.

The grating element used in the rejection is different from the element used in the present invention and therefore the teachings of the present invention cannot be rejected under 35 U.S.C. 102(e).

The functional recitation of claim 1 has been amended.

Claims 2-5, 8-12, 19,22-33, are dependent claims based on independent claim 1 . Inasmuch as claims 1 is allowable, these dependent claims are allowable by definition. Claims 39-42,45-50,54-56 and 59-69, are dependent claims based on independent claim 38. Inasmuch as claims 1 is allowable, these dependent claims are allowable by definition.

3. <u>Claim Rejections under 35 U.S.C. § 103(a)</u>

Claims 1-12,19,22-49, 56 and 59-73 are rejected by the Examiner under 35 U.S.C. § 103(a) as being unpatentable over Sullivan et al. (US 6,621'957), in view of Glenn et al. (US 4,807'950), Glenn et al. (US 5,388,173) or Laming et al. (US 6,169,829).

Claims 1-12, 19-49 and 56-73 are rejected by the Examiner under 35 U.S.C. § 103(a) as being unpatentable over Sullivan et al. (US 6,621'957) , combined with either Glenn et al. (US 4,807'950) , Glenn et al. (US 5,388,173) or Laming et al. (US 6,169,829), further in view of Fells et al. (US 6,363,187) .

Claims 1-18 and 38-55 are rejected under 35 U.S.C 103(a) as being unpatentable over Myers et al. (US-2003/0210863) in view of Sullivan (US 6,621'957) combined with Glenn et al. (US 4,807'950), Glenn et al. (US 5,388,173) or Laming et al. (US 6,169,829).

Glenn et al. '950, '173, Laming et al '829, Fells '187 teach methods to record reflective fiber Bragg gratings in the core of the optical fiber. Because the element in the application is a volume holographic grating, which has a very different shape and size than a fiber Bragg grating (thin tube versus thick slab), the methods described by the patents above are not applicable to volume holographic gratings.

The functionality of the element used in the rejection is different from the element used in the present invention and therefore the teachings of the present invention cannot be rejected under 35 U.S.C. 103(a).

The grating element used in the rejection is different from the element used in the present invention and therefore the teachings of the present invention cannot be rejected under 35 U.S.C. 102(e).

Claims 2-37 are dependent claims based on independent claim 1. Inasmuch as claims 1 is allowable, these dependent claims are allowable by definition.
Claims 38-73, are dependent claims based on independent claim 38. Inasmuch as claims 1 is allowable, these dependent claims are allowable by definition.